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Smith, Gambrell & Russel, LLP
Beveridge, DeGrandi, Weilacher & Young
Intellectual Property Group
1850 M Street, N.W. (Suite 800)
Washington, DC 20036

EXAMINER	
SIANGCHIN, KEVIN	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/866,773	TAKATSUKA ET AL.	
	Examiner	Art Unit	
	Kevin Siangchin	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05/30/2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

Specification

Objections

1. The disclosure is objected to because of the following informalities:

   a. On page 1, line 31 of the Applicant's disclosure, the word "rage" should be replaced with the word "range".

   b. The sentence on page 1, lines 31-35 of the Applicant's disclosure should be revised to correct the apparent grammatical errors.

   c. On page 2, line 16 of the Applicant's disclosure, the phrase "like in a good whether" should be replaced with "like in good weather".

   d. The sentence on page 3, lines 32-34 of the Applicant's disclosure ("The sight-axis switch … on the route") should be revised to correct the apparent grammatical errors.

   e. On page 4, lines 18-19 of the Applicant's disclosure, the phrase "an intensifier that responses to faint light" should be changed to correct the apparent grammatical error. For example, change the phrase to "an intensifier that is responsive to faint light".

   f. On page 7, line 37 of the Applicant's disclosure, the word "stere-image" should be changed to "stereo-image".

   g. On page 8, line 2, of the Applicant's disclosure, the word "rout" should be changed to "route".

Appropriate correction is required.

Claims

Objections

2. Claims 3-4 are objected to because of the following informalities. Claims 3 and 4 refer to *vision data*. In order to maintain consistency among the claims, the Applicant should change *vision data* with *view data*. Appropriate correction is required.

Rejections Under 35 U.S.C. § 112(2)

3. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 6 proposes that one of the stereo cameras be a *milli-wave camera*. Given the wavelength in which these systems operate, MMW cameras do not particularly lend themselves to being *stereo* cameras. Taking this into account, claim 6 will be interpreted, henceforth, as: "The integrated vision system according to claim 1 further comprising at least a first stereo-camera, a second camera and a third stereo camera, the first stereo camera being an infrared camera, the second camera being a milli-wave camera and the third stereo camera being an intensifier, the first, the second and the third stereo-cameras being selectively used in accordance with actual views".

Rejections Under 35 U.S.C. § 102(e)

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Yasui et al. (U.S. Patent 6,483,429).

6. *The following is in regard to Claim 1.* Yasui et al. disclose a parking assistance system (obstacle detection sytem) mounted in a vehicle (Yasui et al. Abstact). The parking assistance system generates 3D data corresponding to the obstacle and displays this to the user or passenger. In this way, the parking assistance system can be considered an integrated vision system, in the same vein as the Applicant's integrated vision system. Yasui et al.'s system includes:

(1.a.) At least one stereo-camera installed in a vehicle for taking images of predetermined outside area (e.g. camera 10 in Yasui et al. Fig. 1).

(1.b.) Stereo-image processing of a pair of images taken by the stereo-camera to recognize objects that are obstacles to the front, thus generating obstacle data.. See Yasui et al. column 2, lines 38-64. The components of Yasui et al.'s system executing this process would, therefore, constitute a stereo-image recognizer.

(1.c.) Generating three-dimensional view data based on the pair of images taken by the stereo-camera and the obstacle data from the stereo-image recognizer. See Yasui et al. column 2, lines 38-64, column 3, lines 30-62, and Fig. 3. The components of Yasui et al.'s system that generate this data can be regarded as the view data generator. These components are *integrated* in the sense that they are part of the parking assistance system.

(1.d.) An image display (e.g. display 30 in Yasui et al. Figs. 1-2) for displaying the view data, generated according to step (1.c), as visible images to crew on the vehicle. See Yasui et al. column 4, lines 18-21. This display is integrated in the sense that it is part of the parking assistance system.

It has thus been shown that the parking assistance system of Yasui et al. represents an integrated vision system that conforms to the system set forth in claim 1. In this way, Yasui et al. anticipates the claimed integrated vision system of claim 1.

7. *The following is in regard to Claim 4.* As shown above the parking assistance system of Yasui et al. can be considered an integrated vision that conforms to all limitations of claim 1. The system of Yasui et al. further

includes the capability of removing the three-dimensional (3D) vision data from the integrated vision data. See Yasui et al. column 10, lines 15-24. That is, 3D data relating to the detected obstacle is removed from the displayed image (α).It has thus been shown that the parking assistance system of Yasui et al. represents an integrated vision system that conforms to the system set forth in claim 4. In this way, Yasui et al. anticipates the claimed integrated vision system of claim 4.

8. Claims 1 and 5 are rejected under 35 U.S.C. 102(e) as being anticipated by Strumolo et al. (U.S. Patent 6,535,242).

9. *The following is in regard to Claim 1.* Strumolo et al. disclose a system for acquiring and displaying vehicular information – more particularly, 3D information of objects and/or the environment surrounding the vehicle. As with Yasui et al., this system can be considered an integrated vision system in the same vein as the that of the Applicant. Strumolo et al.' system includes:

(1.a.) At least one stereo-camera installed in a vehicle for taking images of predetermined outside area (e.g. stereo camera pairs 18, 20 and 22, 24 depicted in Strumolo et al. Fig. 1).

(1.b.) Stereo-image processing of a pair of images taken by the stereo-camera to recognize objects that are obstacles to the front, thus generating obstacle data. Since the stereo cameras capture stereo images of objects (e.g. obstacles) in front of the vehicle (Strumolo et al. column 3, lines 61-64) and displays to the user a 3D representation of the capture objects (Strumolo et al. column 2, lines 26-36), stereo-image/stereo-vision processing of stereo-image pairs is an inherent feature of the system of Strumolo et al. The components of Strumolo et al.'s system performing the stereo-image processing would, therefore, constitute a stereo-image recognizer.

(1.c.) Generating three-dimensional view data based on the pair of images taken by the stereo-camera and the obstacle data from the stereo-image recognizer. See Strumolo et al.

column 2, lines 9-36. Note that the display of 3D data of objects, acquired from the stereo images captured by the stereo cameras, necessarily entails the generation of 3D view data. Furthermore, stereo-image processing, such as in step (1.b) genererally involves the generation of 3D view data from pairs of images. The components of Strumolo et al.'s system that generate this data can be regarded as the view data generator. These components are *integrated* in the sense that they are part of Strumolo et al.'s system. .

(1.d.) An image display (e.g. display 12 in Strumolo et al. Figs. 1) for displaying the view data, generated according to step (1.c), as visible images to crew on the vehicle. See Strumolo et al. column 2, lines 26-36. This display is integrated in the sense that it is part of the system of Strumolo et al.

It has thus been shown that the vehicular information system of Strumolo et al. represents an integrated vision system that conforms to the system set forth in claim 1. In this way, Strumolo et al. anticipates the claimed integrated vision system of claim 1.

10. *The following is in regard to Claim 5.* As shown above the parking assistance system of Strumolo et al. can be considered an integrated vision that conforms to all limitations of claim 1. Furthermore, the stereo-cameras of Strumolo et al.'s system include two infrared cameras arranged as separated from each other by a distance corresponding to a specific base line. See Strumolo et al. column 3, lines 57-67 to column 4, lines 1-18 and notice reference numbers 18, 20 and 22, 24 in Fig. 1. Therefore, the vehicular information system of Strumolo et al. represents an integrated vision system that conforms to the system set forth in claim 5. In this way, Strumolo et al. anticipates the claimed integrated vision system of claim 5.

Rejections Under 35 U.S.C. § 103(a)

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 6,445,815) in view of Hamilton et al. (U.S. Patent 5,296,854).

13. *The following is in regard to Claim 1.* Sato discloses an augmented reality presentation system, with a specific application to collision detection (Sato column 17, lines 32-38), where 3D images are generated from sequences of stereo images and presented to the user via a head-mounted display (HMD). The augmented reality system (ARS) generates 3D data corresponding to an object in the view of a user (e.g. an obstacle) and displays this to the user or passenger. In this way, the ARS can be considered an integrated vision system, in the same vein as the that of the Applicant. Sato's ARS includes:

(1.a.) At least one stereo-camera for taking images of predetermined outside area (e.g. camera 102L and 102R depicted in Sato. Fig. 1).

(1.b.) Stereo-image processing of a pair of images taken by the stereo-camera to recognize objects that are obstacles to the front (Sato column 17, lines 32-38), thus generating obstacle data. See, for example, column 10, lines 20-47 and column 17, lines 32-38. The components of Sato's system performing the stereo-image processing would, therefore, constitute a stereo-image recognizer.

(1.c.) Generating three-dimensional view data based on the pair of images taken by the stereo-camera and the obstacle data from the stereo-image recognizer. See, for example, Sato column 7 lines 9-16, column 12 lines 46-50, and column 16 lines 36-51. The image generation module 300 of the various embodiments of Sato's system can be considered an integrated view data generator.

(1.d.) An image display (e.g. see-through HMD 100 in Sato Fig. 16) for displaying the view data, generated according to step (1.c).

Sato suggest that this ARS be used in a vehicle, namely a moving robot (Sato column 17, lines 39-43). Despite this, Sato does not show or suggest that the vehicle be a human or *crew*-carrying so that view data is displayed to *a crew on the vehicle.* (The HMD and the moving robot would presumably be separate in the augmented reality system of Sato).

14. Hamilton et al. discuss the application of a virtual image display system, similar to the ARS of Sato, on board a crew-carrying vehicle, namely a military helicopter. See Hamilton et al. Figs. 1-3 and 7 and column 4, lines 1-60, column 14 lines 49-68 and column 15 lines 1-37.

15. The teachings of Hamilton et al. and Sato are combinable because they are analogous art. Specifically, the virtual image display systems of Hamilton et al. and the ARS of Sato both can be classified as virtual, mixed and/or augmented reality systems and, moreover, share several structural and functional similarities. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to integrate the ARS of Sato into a vehicle, such as a military helicopter, as suggested by Hamilton et al. As suggested by Hamilton et al. (Hamilton et al. column 3, lines 57-61) A motivation for such an application of Sato's ARS would have been to allow the crew situational awareness even when confronted with low visibility or otherwise difficult flight conditions. Combining the teachings of Sato and Hamilton et al., in this manner, yields an vision system that conforms to that which is set forth in claim 1.

16. *The following is in regard to Claim 2.* As shown above, the teachings of Sato and Hamilton et al. can be combined to yield an integrated vision system that satisfies all aspects of claim 1. Both Sato and Hamilton et al. employ HMDs in their vision systems. Hamilton et al. further include panoramic[1] view data in the HMD of their virtual image display system (Hamilton et al. column 10, lines 23-27). The advantage of using panoramic view data in a virtual, augmented or mixed reality system is that it provides a complete, continuous view of the scene or rendered objects from any viewing direction. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to generate panoramic view data, as suggested by Hamilton et al. (and well-known in the art) and incorporate that into the HMD of the vision system obtained by combining the teachings of Hamilton et al. and Sato in the manner discussed above. In doing so, one would have obtained a method that conforms to the integrated vision system of claim 2.

17. *The following is in regard to Claim 3.* As shown above, the teachings of Sato and Hamilton et al. can be combined to yield an integrated vision system that satisfies all aspects of claim 1. Both Sato (e.g. Sato column 16 lines 35-43, column 16 lines 59-61, and column 17 lines 1-13) and Hamilton et al. (e.g. Hamilton et al. Fig. 7 and

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[1] Note that *peripheral wide-area view data* will be interpreted here as being *panoramic* view data, as this is a term more descriptive and frequently used in descriptions of virtual/augmented reality systems.

column 4, lines 50-59), include in their systems a HMD for overlapping the visible images of the integrated view data (i.e. the 3D representations of the objects in the scene) and actual view. Sato additionally suggests the usage of a see-through HMD, as utilized in several prior art augmented reality systems (Sato column 1, lines 13-23 and column 8, lines 23-28). Overlaying virtual objects over real scenes has the advantage of providing a more natural visual environment in which the crew member can operate the vehicle. Furthermore, this obviates the computational burden of generating a realistic, fully-virtual environment. Taking this into account, it is clear that the vision system, obtained by combining the teachings of Hamilton et al. and Sato in the manner discussed above, conforms to that which is proposed in claim 3.

18. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Strumolo et al., in view of Sarangapani (U.S. Patent 6,055,042), in further view of Shoucri et al. (U.S. Patent 5,999,122) and Owens et al. ("Passive Night Vision Sensor Comparison for Unmanned Ground Vehicle Stereo Vision Navigation").

19. *The following is in regard to Claim 6.* As shown above, Strumolo et al. disclose a vision system that is in accordance with claim 6. The vision system of Strumolo et al. further includes a set of infra-red stereo cameras (see the discussion above with respect to claim 5). However, while Strumolo et al. show the use of multiple stereo cameras, they fail to show or suggest the usage of at least a first stereo-camera, a second stereo-camera and a third stereo camera, where the second stereo camera is a milli-wave camera and the third camera is an intensifer. Strumolo et al. also do not show or suggest that the each of the set of cameras being selectively used in accordance with actual views.

20. Sarangapani disclose an apparatus for obstacle detection in the path of a mobile machine (e.g. truck 100 in Sarangapani Fig.1 – see Sarangapani Abstract). This apparatus uses multiple sensors (Sarangapani column 3, lines 27-30), each suited for particular environmental conditions, object properties, and distance accuracy (Sarangapani column 3, lines 30-47). Sensors are selected depending on their accuracy in measuring objects at certain distances (Sarangapani column 3, lines 5-26 and Fig. 8, step 806). The selected sensors (either near-range of far-range) are weighted according to the measured environmental conditions and object characteristics (Sarangapani Fig. 8 steps

808 or 810, column 3 lines 60-65, and column 5 lines 65-67 to column 6 lines 1-17). Thus, Sarangapani teaches each of the set of sensors/scanners (cameras) being selectively used in accordance with actual views.

21. Sarangapani and Strumolo et al. are combinable because they are analogous art, that is, both are related to object/obstacle detection. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to extend the functionality of Strumolo et al.'s system to include multiple sensors or cameras and selectively operate those cameras, in the manner of Sarangapani, according to the conditions observed by the sensors or cameras (i.e. the actual image). Clearly, the advantage of doing this would have been to make the system thus obtained adaptive to change conditions detected by any of the various cameras.

22. Though the set of sensors suggested by Sarangapani includes, though is not limited to, radar scanners (Sarangapani, column 3, lines 38-44), infrared scanners and optical scanners (Sarangapani column 3, lines 27-29), neither Strumolo et al. nor Sarangapani suggest that the radar sensors be milli-wave radar sensors, nor do they suggest that the optical scanners be intensifiers.

23. According to Shoucri et al., "[v]irtually any type of imaging system that can benefit by providing quality images under low visibility conditions could benefit by using millimeter-wave imaging". In particular, Shoucri et al. suggest that millimeter-wave imaging has particular applicability to collision detection and avoidance systems. See Shoucri et al. *Discussion of the Related Art*, paragraph 1. This reflects what was well-known at the time of the Applicant's claimed invention. Furthermore, it was well-known at the time of the Applicant's claimed invention that such millimeter-wave imaging systems typically utilize passive millimeter-wave cameras.

24. These teachings of Shoucri et al. and those of Sarangapani and Strumolo et al. are combinable because they are analogous art. In particular, the cited teachings of Shoucri et al. and the teachings of Sarangapani and Strumolo et al. are all directed toward the detection of obstacles and/or collision avoidance. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use a millimeter-wave camera as one of the set of sensors in the system, obtained by the combination of Sarangapani and Strumolo et al. Following from the discussion above, adding such a millimeter-wave camera to a vision system, involving the obstacle detection (e.g. the systems of Sarangapani and Strumolo et al.) would have been advantageous because such cameras can provide quality images under adverse visibility conditions. Thus, the combination of Shoucri et al., Sarangapani and Strumolo et al. yields a system, in accordance with claim 1, further comprising a multitude of

cameras (or sensors), say a first, second and third sensor, etc., wherein the first sensor is an infra-red stereo camera (Strumolo et al.), the second sensor is a millimeter-wave camera and each of the multitude of sensors, or cameras, is selectively used in accordance with actual views. However, neither of Shoucri et al., Sarangapani ,and Strumolo et al. teach that a one of the multitude of cameras or sensors, say the third camera, be an intensifier.

25. Owens et al. discuss a night-vision stereo camera (sensor)[2], consisting of cooled FLIRs, deployed on an unmanned ground vehicle (XUV). See Owens et al. *Abstract* and *Introduction.* According to Owens et al. (e.g. last sentence of *Summary and Conclusion* on page 131 of Owens et al.), "Only cooled COTS [commercial off the shelf] night vision sensors have the necessary sensitivity, exposure speed and synchronization capability to be used successfully as nighttime stereo vision cameras on board moving XUVs".

26. The teachings of Owens et al. are combinable with those of Shoucri et al., Sarangapani ,and Strumolo et al. because they are analogous art. In particular, Shoucri et al. (those cited above), Sarangapani , Strumolo et al., and Owens et al. are directed to obstacle detection and/or collision avoidance. Furthermore, these teachings all have demonstrated applicability to ground-based vehicles. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use a night-vision stereo sensor, consisting of cooled FLIRs, as one of the set of sensors in the system, obtained by the combination of Sarangapani , Strumolo et al., and Shoucri et al. According to Owens et al. (e.g. last sentence of *Summary and Conclusion* on page 131 of Owens et al.) such a modification would have been advantageous because, "[o]nly cooled COTS [commercial off the shelf] night vision sensors have the necessary sensitivity, exposure speed and synchronization capability to be used successfully as nighttime stereo vision cameras on board moving XUVs". Combining the teachings of Strumolo et al., Sarangapani, Shoucri et al., and Owens et al., in the manner described above, yields a vision system, in accordance with claim 1, further comprising at least a first stereo-camera, a second stereo-camera and a third stereo camera, the first stereo camera being an infrared camera (Strumolo et al.), the second stereo camera being a millimeter-wave camera (Shoucri et al.) and the third stereo camera being an intensifier (Owens et al.), the first, the second and the third stereo-cameras being selectively used in accordance with actual views (Sarangapani). Such a system satisfies the limitations of claim 6.

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2 Night-vision sensors, be it a stereo sensor, consisting of cooled FLIRs, or otherwise, will be considered here as an *intensifier*, since these intensify, in some manner, the sensitivity of the sensor to the low-intensity light of night.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Siangchin whose telephone number is (703)305-7569. The examiner can normally be reached on 9:00am - 5:30pm, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin Siangchin
ks
Examiner
Art Unit 2623

ks – 05/16/04

AMELIA M. AU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600